People and Brushland Management Conference and Workshop

PROCEEDINGS

Mendocino National Forest
Alder Springs, California
May 3 and 4, 1975

Sponsored by

Cooperative Extension
University of California

USDA Forest Service

Technical Editors

Elliott L. Graham
Public Information Officer
Mendocino National Forest
Willows, California

Theodore E. Adams Jr.
Extension Wildlands Specialist
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PREFACE

California has extensive areas covered with brush and oak woodlands. These areas are found throughout the coast range from Mexico to Oregon, in the southern California mountains and along the foothills and lower mountain slopes of the Sacramento and San Joaquin Valleys. The mature, native vegetation on these areas often creates a serious fire hazard. California history is filled with reports of great losses within and below these brushlands caused by wildfires and subsequent flooding.

This conference offered an opportunity for reporting and discussing the technology that has been used in brushland management to increase the value of brushlands resources. The papers in the proceedings discuss some of the past practices in brushland management as well as some of the opportunities for management in the future.

The sponsors of the conference would like to acknowledge the following agencies and groups that endorsed and participated in the conference:

California Section, Society for Range Management
Shasta College, Redding
National Wildlife Federation, Sacramento
California State University, Fresno
USDA Soil Conservation Service
California State University, Northridge
Redwood Coast Chapter, S.A.F.
Fullerton College, Fullerton
California Farm Bureau Federation
Ecology Center, Berkeley

Publication of the proceedings was supported by the California Section, Society for Range Management.

Co-chairpersons: Fremont "Monte" Bell, Farm Advisor, Cooperative Extension, University of California, Orland, California
Blaine L. Cornell, Forest Supervisor, Mendocino National Forest, U.S. Forest Service, Willows, California

CONFERENCE AGENDA

People and Brushland Program

Saturday, May 3:

1:00 - 1:30	Registration - Elk Creek High School
1:30 - 1:45	Introductions, Conference Purpose and Agenda Monte Bell, Glenn-Colusa Farm Advisor, U.C. Extension
1:45 - 2:05	Our California Brushland Resource Ted Adams, Extension Wildlands Specialist, U.C. Davis
2:05 - 2:15	The Local Forest Situation Blaine Cornell, Supervisor, Mendocino National Forest
2:15 - 2:45	The Brushland Ecosystem Ray Dalen, Division of Range Management, Calif. Region USFS
2:45 - 3:00	Many Faces of the Forest (slide presentation) Jan Seils, Corning District Ranger, Mendocino National Forest
3:00 - 4:00	After 20 Years - Bus Tour via Old Forest Highway
4:00 - 5:00	Forest Observation Point - Changes in the Forest Jay Bentley, Soil Science Consultant (USFS Retired) Joe Ely, Forester, U.S. Forest Service (Retired) Bill Thornton, Unit Manager, Calif. Dept. of Fish and Game Blaine Cornell, Forest Supervisor
5:30 - 6:30	Alder Springs Gymnasium Secure Quarters - Relax - Get Acquainted
6:30	Beef barbecue dinner with all the trimmings
7:45 -10:00	Viewpoints on Brushland Resources Panel members will present ideas on use of brushland from various points of view -- recreation, watershed, livestock, wildlife, preservation, government, conservation, education, research and politics Monte Bell, Moderator Dr. Richard Martyr, Audubon Society Larry Kimil, California Chamber of Commerce Brooks Sibley, California State University, Humboldt Doug Leisz, Regional Forester Lou Moran, California Department of Conservation Questions - Answers - Discussion

Sunday, May 4:

7:30 - 8:30	Breakfast
	Chairman of the morning program - Ted Adams
8:30 - 9:30	Resource Value Analysis Process U.S. Forest Service Staff
9:30 -10:30	Workshops - "How I Would Manage the Brushlands" Small Group Discussions
10:30 -11:00	Report from Workshops
11:00 -11:15	"You Said IT - Now What Can You Do About IT?" William L. Reavley, National Wildlife Federation
11:15 -12:00	Enroute to Elk Creek

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A limited number of extra copies of the Proceedings are available from:

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OUR CALIFORNIA BRUSHLAND RESOURCE

Theodore E. Adams, Jr.
Extension Wildlands Specialist
University of California, Davis

What are brushlands? This resource is perceived in many different ways. Some people view this vast expanse of vegetation as a natural garden, a unique ecosystem to be protected from man. Others may view it as simple open space that offers visual relief and escape from urban congestion. In various ways it is used for recreation; people enjoy trail riding, use of off-road vehicles, hiking and studying nature in brushlands. These perceptions and uses might be categorized as social values.

Wildlife is a concern statewide, and brushlands as wildlife habitat is a recognized value. Whether our interest lies with game animals, non-game species, or those classified as threatened and endangered, the value of brushlands for wildlife is discrete.

A third valuation of brushlands is as a source of food and fiber. Several classes of livestock graze on brushlands consuming brush directly or grazing on grasses and forbs seeded where brush has been removed. Cattle, sheep and angora goats provide food. In addition, the latter two classes provide fiber for clothing. Some species of woody plants within the brushland ecosystem are being processed for wood chips used in producing a variety of wood and paper products.

Over 25 percent of our water production comes from watersheds protected by brushlands (Berry, 1973). Water has a very clear value in California. Its availability affects us all. Management of brushlands to ensure maintenance of water production is a distinct element in management decisions.

Several environmental concerns are associated with brushlands. Maintenance of water quality is one of these. Sediment in water and siltation of reservoirs are influenced by brushland management and most spectacularly by wildfire, another environmental concern. Wildfire is perhaps the most dramatic aspect of brushlands. The risk of holocausts like the 170,000-acre Laguna fire in San Diego in 1970 increases with our impingement on brushlands. Urban encroachment is one facet of this impingement, but people who desire to escape the pressures of urban life and experience nature in the brushlands add to the risk. The mobility of our population and the desire by many to live away from their neighbors in brushlands are one reason wildfires on private lands have been increasing at an annual rate of 5 percent for the past several years (Robert Lix, California Division of Forestry, personal communication).

All defined values, activities, and environmental concerns associated with brushlands have in common management of vegetation. No activity in brushlands has a single effect. Any action that we take or fail to take in brushlands is reflected throughout this ecosystem.

To adjust our perspective we must give our California brushlands some definition. What is this brush called chaparral by the Spanish? How extensive is it in California? Have we had an influence on its development?

If we examine California we find that about 65 percent of the state can be classified as wildlands. This area is more than six times the size of that devoted to traditional agriculture and represents a vast resource almost equal in size to the State of Oregon. Of this area, 35 percent or about 23 million acres is brushland of various types (Berry, 1973). There is much diversity in these brushlands but the majority is a type called chaparral. The name chaparral is derived from the Spanish word chaparro, the name of an evergreen oak in Spain. Chaparral means the place where this oak grows. The appearance of our chaparral reminded early Spanish explorers of their homeland. In common usage, chaparral means any dense growth of stiff or thorny shrubs or dwarf trees. It is a collective term applied in the western United States to shrubby "hard" brush.

The many species of shrubs present in chaparral represent a single ecological type. The dominant features of these plants are the root systems (extensive in relation to plant size), the dense, rigid branching character of the plants, and especially the broad, leathery leaves that possess a thick, waxy coating. This latter characteristic is extremely important to plant survival because it minimizes moisture loss through evaporation. There are few exceptions to this description; but chamise, one of the most important species, is one of them. Its leaves are short and needle-like instead of broad and leathery, and they are borne in fascicles or whorls around the stems.

Climate is the major factor determining chaparral development. The Mediterranean-like climate of much of California is characterized by mild, wet winters and hot, dry summers. This combination promotes abundant growth but slow decomposition of accumulated plant debris. As a result, debris or fuel accumulation in certain mature stands of chaparral may approach 100 tons per acre (Nord and Countryman, 1971).

The combination of climate and debris accumulation represents an extreme fire hazard. For this reason, the risk of fire is great.

Fire has been an important factor in the chaparral environment for millions of years (Hanes, 1974). Fires normally recur in chaparral on about a 20-year cycle, depending upon fuel accumulation, and all of the plants and animals of the chaparral are in one way or another adapted to fire (Muller, 1965?).

Life span of chaparral shrubs is difficult to determine because of the frequency of fire. However, areas that escape fire for more than 40 years contain an unusual number of dead plants of the genus Ceanothus, an important source of browse for deer (Muller, 1965?). Survival of these plants in the chaparral ecosystem appears dependent on a fire cycle of less than 40 years.

For rejuvenation, many shrubs must be burned back to encourage vigorous, healthy sprouts. These sprouts are an important source of nutrition for deer and other animals.

The dependence of the seed germination process on fire is widespread in chaparral plants. Included are both woody plants and herbaceous species. Among the latter are plants that appear only following a fire and disappear after one season (Ornduff, 1974). These unique annuals are truly fire dependent.

We've looked at the chaparral of California and noted how it has adapted to fire and depends on this element for renewal. Like the legendary Phoenix bird, chaparral is consumed by fire and emerges, renewed, from the flames.

Man's presence in California increases the risk of wildfire in a region where fire hazard is already great. His numbers (20 million plus), his extreme mobility, and his encroachment on brushlands through spread of urban areas contribute to the risk of wildfire.

Each year about 215,000 acres are burned by wildfire in California (Sources: California Division of Forestry, U.S. Forest Service, Bureau of Land Management). Most of these fires are caused by man, and they are on the increase. Currently, on private lands about one half of one percent of the wildfires burn 77 percent of the acreage involved in these fires (Lix, California Division of Forestry, personal communication). Wildfires of the magnitude indicated by this statistic are not friends of man or wildlife.

Our brush fields are currently an economic liability. Tens of millions of tax dollars are spent annually fighting fire in these vast areas. More hundreds of millions are the measure of property damaged and resources destroyed, either directly by wildfire or following in its wake.

A partial solution to the wildfire problem is construction of fuel breaks. These areas where type conversion has been accomplished serve to break up vast, flammable brush fields, and provide access for fire suppression. In addition, they enhance wildlife habitat. Their construction frequently employs the tools and techniques developed through the brush range improvement program: mechanical treatment of brush to enhance dessication; use of prescribed fire in the treated areas when weather conditions permit; reseeding with herbaceous species where necessary; control of brush sprouts and seedlings.

Historical information and research demonstrate the relationship between certain fires and deer numbers (Biswell, et al., 1952; Taber and Dasmann, 1958). Opening brushlands through burning improves deer habitat and results in an increase in numbers of deer.

Managed shrubland that includes a substantial proportion of herbaceous growth will provide deer a balanced diet that includes nearly 50 percent grasses and forbs (Taber and Dasmann, 1958). Dense, decadent chaparral, in contrast, contains little herbaceous growth and supports fewer deer in relatively poor health. Even an occasional wildfire is inadequate to more than temporarily improve conditions, although such occurrences do improve the nutritional status of browse. For example, chamise sprouts one to two years old will contain in late winter and early spring twice the protein found in unburned chamise (Taber and Dasmann, 1958). The real answer to good deer habitat remains managed shrubland that contain sufficient herba-

ceous material to provide a quality diet during winter and early spring when nutrition is most critical.

If habitat suitable for deer is provided a majority of wildlife will benefit. In brushlands maintenance of an intermediate stage of succession will insure a greater variety of wildlife and numbers of animals compared with a decadent brush field or the desolation following a wildfire. Maintenance of such a condition is possible. We need only treat and burn brush, reseed where necessary and control brush sprouts and seedlings in selected areas.

At this point, a review of the needs of wildlife would be helpful. Wildlife require an environment or habitat that will sustain them--food, cover, space, and water. When these factors are in balanced supply, they contribute to the well-being of the animal. If any one factor is in short supply, it will limit the number and distribution of wildlife.

Each wildlife species has specific requirements. Dense brushlands are not an indicator of an abundance of quality food for each species that may be present. As an example, mature brush is a less nutritious source of browse for deer compared with juvenile brush. In addition, there is a seasonal variation in browse quality.

Deer are selective in their grazing habits and will choose species of plants and age classes that are most nutritious (Taber and Dasmann, 1958). This, of course, assumes they are free to make this choice.

Just as brush density fails to provide a measure of food abundance and quality for all wildlife, so it fails to indicate value of brushlands for cover. Wildlife vary in their requirements for cover that protects them while feeding, reproducing, resting, sleeping and traveling. Some animals prefer and may require conditions that are open to insure their survival. Others require dense vegetation for security. Besides vegetation, other natural features such as burrows and rocks are used as cover. Because vegetation is dense, it does not mean cover is adequate for all classes of wildlife.

Each species of wildlife lives in a community of plants and animals that best meets its needs. Some species of wildlife can adapt to wide variations in their environment; others may be very specific in their habitat requirements.

We have observed how an intermediate stage of succession supports great species variety and animal biomass. However, a unit of land containing a variety of plant communities representing different stages of succession will provide numerous habitats where the maximum variety of wildlife can exist.

Let's take another look at a standard fuel break and see how it might be improved to benefit wildlife without sacrificing its basic purpose.

In terms of topography, where should management begin? Let's examine two opposite slopes. North slopes possess the greatest variety of plant life and consequently harbor the largest variety and greatest quantity of wildlife. Conversely, south slopes are hot and dry with more limited plant

resources. However, in winter and early spring south slopes are potentially more productive in terms of herbaceous growth. As a general rule, brush management for habitat improvement should be concentrated on south facing slopes where, incidentally, the most flammable brush is generally found. The total area treated should be about 50 percent of that available on north and south slopes combined, two-thirds concentrated on south facing slopes and one-third on north facing slopes (Taber and Dasmann, 1958).

Creation of edge in the manipulation process is exceedingly important. Many species of wildlife tend to concentrate near the zone of transition between vegetative types. This is known as the edge effect. To create this edge within the managed area, between 10 and 30 percent of the brush should be left as islands for escape and cover. Depending on circumstances and the vegetation complex, these islands should probably range from a minimum of one-half to two acres in size to as large as 10 to 20 acres if deer cover is critical within the managed area. Distances between all areas of cover generally should not exceed 600 feet, and the brush islands should be burned on a rotational basis to enhance their forage value.

The edges of large cleared areas should be "feathered" to create a transition between managed and unmanaged brush and to enhance the forage value of the transition zone.

Water development in managed areas is critical. Habitat is only as useful as its weakest element. Development of quail guzzlers and other water sources, should, under optimum conditions, provide water every one half mile.

In a diagramatic presentation we can see just how easily edge can be provided by brush islands and how their numbers can multiply the effect. A management area containing four square units has eight linear units of edge. If a single square island of approximately 8 percent of the managed area is left, 2.4 linear units of edge are added. This increases total edge by about 30 percent. If the one island is divided into five smaller islands of equal size, the additional edge created is equivalent to five linear units. By division, we have multiplied the edge effect and added over 60 percent to the original figure of eight linear units.

Berry (1973, p. 7-8) in his discussion of brush removal states the following:

"For almost as long as we have had a livestock industry, range operators have been engaged in a conflict to reduce the invasion of brush into areas used for livestock production. Expanding residential and industrial use of prime agricultural lands has dictated that more productive lower elevation range lands be shifted to more intensive agricultural uses. This has forced the livestock operator to move his operation "farther up the hill" so to speak and he has had to turn to intensive brush removal practices to maintain the livestock industry.

"From time immemorial, fire has been the traditional tool for brush removal. Prior to 1945 there was no formal permit system for range improvement burning and "wildfires" were largely depended upon for range improvement.

Some ranchers used periodic late fall or winter burns to reduce brush concentrations but most of the uses of fire for brush control were usually in violation of fire prevention and control regulations. In 1945 a uniform permit system for range improvement burns was put into effect. This system, under the administration of the California Division of Forestry, in addition to permitting burns, also provided for technical assistance to ranchers on the one hand and set up areas of rancher responsibilities and liabilities resulting from control burns on the other....

"As research and Extension results and practices improved and pointed the way, control burning techniques underwent striking changes and improvements. Seeding of burned over areas became more common. The wise use of herbicides to control brush seedlings and reduce sprouting increased. Preburn treatment of brush by mashing or bulldozing one to three years before burning became more common. Today, the typical control burn is a highly organized and efficient operation conducted by ranchers who are well trained, well equipped and privately financed. A large percentage of the control burns now have as much of the area as possible pretreated before burning and more intensive reseeding practices are used. Herbicide and mechanical treatments are used to retard regrowth. A much better job of planning of the burns is being done and, in general, the size of burn has been reduced so that the necessary post-burn management practices can be carried out.

"The net effect of this control burn program has been a 300% increase in meat production on the treated areas. Water yield has been increased by about 50% and deer and quail habitat has been greatly improved. In fact, increased deer numbers have seriously affected reseeded areas in many cases.

"Since 1945 over 8500 range improvement burns have been conducted on nearly 2.5 million acres. Of these, three-quarters of a million acres have been reburns leaving a net of about 1.8 million acres of new or improved range created by the control burn program. This activity has added many millions of dollars in new wealth to California's economy and has averaged about 7½ million dollars each year."

The public has realized significant benefits from the brush range improvement program, a program conducted mostly at private expense. Reduced threat of wildfire, watershed protection and enhancement, increased recreation potential and enhanced wildlife habitat are all benefits the public enjoys.

Let's accept as a thesis the need to reduce brush for purposes of fuel management. This could be accomplished conventionally as already described or by elaborate mechnical means. The latter approach might employ a giant all-terrain vehicle that could mow and spray brush to maintain an acceptable fuel volume. The tremendous cost of its operation might be partially offset by distillation of wood alcohol for fuel from brush that it could harvest. Its use would probably be limited to protection of highly developed areas where other techniques might be impractical or unacceptable.

To conserve fuel we might employ man power to replace the machine. Brush could be cleared by hand, piled and burned when weather permits to create open vistas aesthetically pleasing and relatively free from the threat of wildfire.

We might modify our approach to the problem and look at it from a different point of view. We could consider utilization of the brush as a resource to affect fuel management. Brushlands represent a storehouse of solar energy. Harvest of this concentration could partially offset the worldwide shortages of fuel and cellulose. The obvious method of harvest is through animals. Animals, a biological tool, could make use of a wasted resource, reduce dependence on feed grains and in the process reduce the fire hazard.

Angora goats may be the all-purpose machine, the biological tool needed. This is an ecologically sound tool. It is biodegradable, produces minimum pollution, is self-perpetuating, and provides animal protein for human consumption and fiber for clothing. In selected areas this animal can utilize an otherwise wasted resource and nicely maintain an acceptable fuel load. By thus reducing the threat of wildfire, angora goats can reduce the potential for accelerated erosion, maintain an existing vegetation, and improve wildlife habitat.

Currently there is much money spent by fire protection and land management agencies to maintain fuel breaks. This maintenance might be more efficiently and economically accomplished by use of animals, i.e., the angora goat. Both producers and the public would benefit from such a practice.

All the values and concerns discussed are interrelated. Use of brushlands or chaparral for one primary purpose does not and cannot eliminate consideration of other values. All will be affected to some degree by manipulation of the vegetation, the basic concern.

The questions that now must be asked are: With what values are we most concerned? How can we best manage brush to reflect those values? What priorities do we recognize and what trade-offs or sacrifices are we willing to make? Answers to these questions will depend on how good a system of economic valuation we develop for all the elements involved.

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LOCAL FOREST SITUATION

Blaine L. Cornell
Forest Supervisor
Mendocino National Forest
U. S. Forest Service

First, I would like to take this opportunity to extend my welcome on behalf of the Forest Service to all of you. I have high expectations for the next several hours that we will have meaningful discussions and exchanges that will broaden our understanding of the complexities of the social and natural values to be realized from the brushlands of this State. While a lot of things have been accomplished, much remains to be done. Neither the resource nor the demands upon the land remain static for long. Thus, we are constantly confronted with the matter of examining or reexamining management direction, values, resource inventories and programs. We will be doing this during the conference. We do have a frame of reference to draw upon with what we have accomplished in the past.

Brushlands occupy a significant portion of the Mendocino National Forest. Of the approximately one million acres within the Forest, 300,000 acres are classed as supporting climax brush vegetation commonly called chaparral. (Refer to map)

The species composition of the local brushlands is varied in relation to aspect, elevation, precipitation, and soils. However, chamise forms a major component of the species composition. Buckbrush, manzanita, scruboak, brichleaf mahogany, toyon and silktassel are commonly associated. Other subtypes occuring on north slopes and in deep canyons are more nearly tree-like and include interior live oak, dwarf canyon live oak, California laurel and manzanita. Digger pine and knobcone pine are scattered throughout the area on favorable sites. Other species of brush and trees (both deciduous and conifers) intermix with brushtypes in "fringe" areas.

The brushlands provide habitat for a variety of birds, mammals and reptiles. Extensive, mature brushfields provide habitat for relatively few species of birds and animals.

Historically, the brushfields on the Mendocino National Forest have been burned over by large, fast-moving fires. In the past 70 years, much of the brushland has burned over at least once. Rates of spread of these fires often exceed 1,000 acres per hour.

The North Coast Range is inherently unstable due to geological formations, soils, and hydrologic processes. Naturally occurring stream sedimentation rates are high. Natural occurring phenomenon (such as fires and floods) have accelerated the land forming process periodically over time. Man-induced disturbance can and has accelerated the land forming process, particularly where large areas of vegetative cover was removed.

At present, the values and benefits sought from the brushlands on and adjacent to the Mendocino National Forest are those that are inherently natural or that can be produced from planned management activities. Urbanization has not encroached on most of these lands, except for some second home developments occurring singly and in small subdivisions. Livestock forage,

recreation in the form of hunting, and water have been the principal resource uses. A portion of the estimated 1.4 million acre feet of water produced annually from the Mendocino National Forest comes from these lands. Some of which is used for irrigation and power generation purposes.

Past management programs have been aimed largely at:

1. Controlling the practice of frequently setting fire to large areas of brushland in a casual way to permit greater production of herbaceous forage for livestock and to maintain deer forage.

2. Establish fuelbreaks to enhance the opportunity to control wildfires and provide for the safety of fireman. (Reference the loss of 13 lives in the 1953 Rattlesnake Fire)

3. Convert brushlands where suitable to grass cover to provide forage for livestock and wildlife.

4. Both items 2 and 3 were designed to also provide alternatives to the practice of unauthorized burning of the public lands.

5. It was assumed that the water yield from treated lands would increase.

Brushlands have typically been considered to be of very low value except in Southern California where population pressures and the associated development and scarcity of water in relation to demand dictated otherwise. More recently, a growing public awareness of the total environment and the increasing use pressures being placed upon these lands with their associated impacts has brought about more conflict.

On the Mendocino National Forest conflicts and an increasingly complex management situation has resulted from heavy off-road vehicle use, declining deer herd populations, use of herbicides in management programs, threatened and endangered or unique species of plants and animals, and the establishment of specific air and water quality standards. The conflicts are generally manifested in public issues that are more frequently being brought into the courts. Court challenges are generally based upon our meeting (or not meeting) the requirements of NEPA. Thus, the changing situation requires that we have an awareness of the planning process so that the best possible management decisions result.

The map will be available for closer review at Alder Springs. The map does show the work that has been accomplished over the last 20 years that is still in evidence today. We will see some of the work and will discuss in more detail, some of the statistics involved.

THE BRUSHLAND ECOSYSTEM

Ray Dalen
Division of Range Management
U. S. Forest Service

The management of chaparral lands is of concern to a wide range of people who view the use these lands from different perspectives.

This paper presents some background information on the ecology of California chaparral as a basis for a better understanding of brushland management problems. Management has been defined as the manipulation of the ecosystem by man. There are many interrelated components to the brushland ecosystem but the vegetation remains the most evident part.

The term chaparral is derived from the Spanish word "chaparra" meaning scrub oak. In California it represents a distinct ecological type between the grassland or desert shrub and woodland or forest. The leaves which are relatively small, thick, and wax-coated are referred to as broad-sclerophyll meaning "hard-leaved" (7). The chaparral covers about 8.5 million acres in California and commonly includes the coastal sage association of short-lived subshrubs (9). Several workers use the terms "hard" brush and "soft" brush to separate these shrub types.

Fire has been recognized as a primary factor affecting the chaparral and is the major cause of secondary succession. Chaparral has been a major plant formation in southern California for the past two million years and the influence of fire has been a dominant environmental factor during this period (8) (9). The distribution and composition of chaparral have remained stable during this period despite climatic changes (8).

The chaparral occurs over a comparatively wide geographical range of precipitation and thermal belts of similar yearly patterns (22). Average annual precipitation does not fall below about 10 inches or go much above 35 inches. The range includes diverse sites as to soil and associated parent material. Much of the chaparral, particularly in southern California is on steep, unstable mountains with high erosion rates and rapid runoff during large storms (20). Rice indicates that gravity is probably the most significant sources of erosional energy on mountainside slopes. In moist areas, gravity accomplishes its work by soil creep and by landslides. In chaparral, landslides resulting from infrequent large storms are possibly the key eroding mechanism (20).

The role of fire is an important factor in accelerating sediment production from chaparral watershed. By destroying the plant cover and creating a water repellant layer in the soil, fire greatly increases surface runoff and consequently magnifies the flood peak that results from a storm (20). This fire accelerated sedimentation is highest the first year following fire and may increase up to about 37 times normal (5). The first year also accounts for about 70% of the accelerated sediment that is produced over the ten-year period that it takes to gradually return to normal (5).

Rice also reported that landslide activity was related to the age of the burn. He found that landlside erosion was 157.7 cubic yards per acre on a 9-year-old burn compared to 5.3 cubic yards per acre on a recent burn and 8.5 cubic yards per acre an area that had not burned for 50 years. He attributes these different rates to root development (20).

The root system of chaparral plants are of interest both in plant succession and in their ability to anchor the soil mass. Hellmers et.al. separated chaparral species into three groups based on rooting characteristics. (1) Woody shrubs, usually sprouting with deep penetration and wide spreading system. This group has the greatest ability to extend roots into cracks of unweathered rock. Chamise and California scrub oak were the deepest measured at about 25 feet. (2) Woody shrubs, usually non-sprouting with shallow but wide spreading system. This includes several species of Ceanothus. (3) Subshrubs with shallow, fibrous systems usually not more than 5 feet deep. The root crowns of sprouting species were greatly thickened if the tops had been repeatedly removed by fire or other causes. Root grafting between plants of the same species was found only on scrub oak (10).

In undisturbed stands most chaparral species are summer dormant due to drought, vegetative growth and seed germination do not occur (9). The primary growing season occurs in the spring and is varible from year to year in its time of arrival and duration. A second but shorter growth period may occur in the fall during favorable years (24).

Chamise, the most common shrub of the chaparral displays some interesting growth patterns. Bedell and Heady report that the length of the growth periods for chamise varied on three growth forms. Based on twig elongation the growing season in 1956 for mature brush plants was 91 days, while hedged plant grew for 119 days, and root crown sprouts grew for 235 days. Sprouts from root crowns grew rapidly from the start of growth through the hot, dry summer months and into the fall (1). The period of most rapid growth on chamise coincides with the rapid depletion of starch (13). Low food reserves during May and June in chamise have been associated with poor survival of sprouts which arise following treatment at this season. In a northern California study sprouts from chamise cut in May and June grew the fastest but started dying in October. By the following summer more than three-fourths were dead. Sprouts from chamise cut during October kept on growing (3). The period of low starch will vary from year to year but follows the onset of spring growth by 4 to 6 weeks (14). It is expected that the effectiveness of treatments to control chamise will be enhanced during this period.

Certain chaparral species have been found to inhibit the seed germination and growth of some herbaceous plants. Muller et.al. report that chamise, eastwood manzanita and bigberry manzanita release water soluble toxins from their crowns and leaf litter (18). These two manzanita species have been shown to inhibit herbs for a distance of 1 to 2 meters from the edge of the drip lines of their canopies. When the vegetation is burned the toxic materials in the plant and litter are destroyed or denatured and the herbaceous seedlings again become established (18).

The Ceanothus spp. apparently lack plant toxins and actually benefit other plant growth. Chaparral whitethorn (Ceanothus lecuodermis) is reported by Hellmers et.al. to improve site conditions by increasing soil nitgrogen (11). They report that plants growing close to other ceanothus species make better growth than plants associated with non-ceanothus species. Dellwiche et.al. examined 12 species of ceanothus in northern California for their ability to fix nitrogen. All species examined were found to fix nitrogen at rates which are ecologically significant (6).

The chaparral is a complex plant association composed of several hundred species yet there are fewer than 20 dominant species and the two major dominants of the California chaparral are chamise (Adenostoma fasciculatum) and California scrub oak (Quercus dumosa). These two species dominate because of their greater apparent persistent ability. Chamise is both a strong sprouter and producer of numerous seedlings. It has a relatively light seed similar to the average weight of the subshrubs which makes easier dispersal (25). Scrub oak is primarily a vigorous and persistent sprouter. Brush seedlings are rare. Longhurst in a study to determine sprouting of four oak species at different seasons found that scrub oak sprouted almost completely even the first year after cutting and showed no significant seasonal differences on cutting made each month over a year's period (16).

Scrub oak also shows a resistance to heavy browsing. Scrub oak is difficult to kill by fire. Pond and Cable studies the effect of burning at different intervals on sprout production of several of the important shrub species in Arizona. Scrub oak (Quercus turbinella) which is similar to California scrub oak proved difficult to kill by burning. Following the first four annual burns, stem counts were considerably higher than the pretreatment number. Only after the fifth annual burn, were live stems fewer than before the first burn. Burning at intervals of 2 or more years failed to reduce sprouting (19).

Plant succession following fire in the chaparral has been studied by various workers. The role of a particular shrub species in chaparral succession after fire must be assessed in relation to resprouting, seeding habits, slope exposure, number of individual plants, and other varibles (9). One of the most important capabilities of the chaparral is the ability to establish itself after fire. Elimination of the chaparral by fire is prevented by:

1. Production of seed at an early age.

2. Production of fire resistant seeds or fire dependent seeds or such large numbers of seed that some survive even though the heat destroys many, and

3. Sprouting from the root crown.

Chamise is strongly sprouting form of chaparral. Extensive stands of chamise and in mixed sprouting chaparral, the recovery after burning is generally rapid and complete and may extend well beyond the pre-fire boundaries of the burn (22). Shrub species that sprout vigorously from root crowns maintain their dominant position in the post fire chaparral (8). Sampson reports that the less extensive areas of non-sprouting chaparral react differently to burning. He indicates the brush seedlings will not completely recapture the soil for several years after burning.

Also they may be killed by a single heavy burn and a relatively rich herbaceous flora then appears and usually persists well after burning (22). Hanes reports that the seedlings of species that fire-kill are usually more abundant then seedlings of sprouting species. Non-sprouters are more localized in distribution and usually play temporary roles in chaparral succession (9). Sampson pointed out several distinct differences in the non-sprouting chaparral after fire: (22)

1. Brush stands somewhat more open, inhabited by a larger number of herbaceous species both before and after burning.

2. Increase in the density of the herbaceous species continued even into the fifth year.

3. More subject to adverse climatic conditions in reestablishing, which has little effect on growth of sprouting form.

Sampson in his studies on recovery of chamise in northern California reported that the invasion of herbaceous plants and grasses made the heaviest stands in the second and third year. The maximum density of this temporary cover was seventeen times that of the pre-fire density. The downward trend in herbaceous vegetation occurred in the third, fourth and fifth years after burning (22). Also significant was the heavy invasion of new brush seedlings of the dominant chamise and green leaf manzanita which were not in the stand before burning. These new brush seedlings and strong growth of brush sprouts are primary factors in the decline of the herbaceous vegetation. The rapid growth of the sprouting chaparral with its consequent reduction in herbaceous vegetation occurs until about the sixth year and continues at a reduced rate to eight years (22).

Sampson attributed the decline in herbaceous vegetation after the second year to shading and competition for soil moisture (22). McKell et.al. reports on a study in San Diego County on a chaparral burn that the period of favorable soil moisture for establishment of perennial grass species to replace chaparral is very short under natural conditions. Only during the first year was there sufficient soil moisture in the burned area to permit the carry over of young seedlings. By the second year the soil moisture on both the burned and unburned were essentially the same (17).

Sampson concluded that burning to control invasion of chaparral in sprouting cover was generally found only temporarily to suppress the brush. In non-sprouting chaparral he states the brush was destroyed by two judicious burnings, preferably two years apart (22).

Hanes and Jones in southern California studied the vegetation response to fire on two burn sites of different age classes (8). They found that the age class difference and slope exposure are apparent in general successional patterns. They conclude that frequent fire on south exposure slopes tend to eliminate the seedlings of those shrubs requiring several years to flower, leaving a stand combination of shrubs produced from root crown sprouts and fast-maturing subshrubs produced from seed. The north slope vegetation in response to more favorable physical condition grows more rapidly and composition changes occur frequently. Therefore, the rate of success is more rapid. The age of the stand at time of burning influences post fire vegetation. A typical young north slope stand on sites frequently burned is

composed mainly of root crown sprouts such as scrub oak and chamise with seedlings of several Ceanothus spp. and some subshrubs. Stands older than 65 years are more diverse in species than young stands. The more frequent the fires fewer the shrub species with a higher number of shorter lived shrubs such as several of the common ceanothus species (8).

Horton and Kraebel studied the development of vegetation during a 25-year period after fire in chamise chaparral in southern California (12). They report the composition of the permanent cover changed little after fire. However, relative abundance of several shrub species in the cover occasionally did change. For instance, the number of hoary leaf ceanothus usually increased after summer and fall fires, but the species was practically eliminated after an early spring fire. Temporary cover usually appeared and reached a peak of growth and density two to five years after fire, than disappear as the permanent cover matured. Seeds of this temporary cover remained viable in the soil for up to 50 years. The composition of the permanent cover was largely determined in the first winter after a fire by the number of sprouting root crowns and the number of permanent species. Condition in the subsequent years were important in determining the number of surviving seedings. Very few chaparral shrub seeds germinated after the first year (12). Plant succession in chaparral is more a gradual elimination of individuals present from the onset than a replacement of initial shrubs by new species (9).

The state of plant succession following fire in the chaparral has an effect on its value as wildlife habitat. Mature, unburned chaparral is not considered favorable deer habitat and the carrying capacity in terms of numbers is low (15). A burn area is definitely better from the standpoint of diet available to deer. Taber and Dasmann report that burning releases nutrients to the soil which are taken up by plants on the burned area thus increasing their nutritive value (23). The fertilizing effect however is short lived being highest the first year and no effect by the third year. The crude protein in unburned chamise is 11-12% in April and drops to 4% in September. By contrast an April spring burn will produce chamise sprouts with crude protein content of 30% the first year, 20% the second year and no effect the third year. A fall burn in September produces the same cycle but with a lower spring protein level of 15%. This is probably because of ash lost from runoff by the winter rains. (23).

Large areas of uniform vegetation types such as chaparral generally are poor habitat and support little benefit to wildlife. From study on the Cleveland National Forest, Bell reports that bird density was less in mature brush with fewer species present compared to a two year old burn site (2).

Chamise a dominant species of the chaparral, is one of the most hazardous wildland fuels. It has the physical characteristics that are conducive to a rapid rate of spread and energy release (4). The stage of plant succession and age class of the stand is related to the potential for large fires. Following fire the brush canopy to reach full development usually requires 8 to 12, during which time little dead wood or litter is produced and presents no particular problem. It requires approximately 20 to 25 years for the brush stand to attain its maximum pre-fire volume and density (5). As the age of the brush stand continues to increase the ratio of dead to live fuels in the stand also increases. Large wildfires are associated with the older age brush stands. For example, on the Los Padres National Forest in a

study area which included two Districts with a cover of chamise chaparral it was found that over 70% of the brush area burned by large wildfires had occurred in stands 31 years or older (5).

Rothermal and Philpot have developed a fuel model for the chaparral of southern California which shows that both rate of spread and intensity of fire increases with age of the chaparral (21). Their analysis confirms that in southern California fires burning under high-wind conditions in brush fields beyond 20 years of age produce fire intensities and spread rates that often make them uncontrollable.

The chaparral has existed for a long time under cyclic conditions induced by fire. Because of their persistant growth characteristics, particularly in the dominant species such as chamise and scrub oak the chaparral will continue to be a major part of California landscape. In determing management objectives and developing program alternatives to better cope with brushland problems, the durability of the vegetative component of the brushland ecosystem must be considered.

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BRUSHLAND MANAGEMENT DECISIONS: WHERE DOES WILDLIFE FIT IN?

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National Forest Land Use Planning -

a) most are intimately acquainted (as a concept and practice).
b) strives to provide a process to allow the impact of management programs to be assessed prior to their implementation.
c) extent to which such a process is successful is a function of the information input and the analysis of that input.
    1. The analysis of input is a vital step which should be designed to provide decision makers with a clear prediction of the ultimate consequences of a given management program.
    2. Model systems which predict the current and future dollar values for timber forage and water resources, wildland esthetic values, recreational and wildlife habitat values are currently being tested and used to and in the decision making process.
    3. Since the model determines the results obtained, great care must be taken to choose a data treatment which as independently as possible evaluates the effect of a given program on each resource of interest; i.e., forage, water, wildlife values.
    4. All resource analysis models require that the resources themselves be well understood. Wildlife can't be managed if only partial list of species in an area are available.

Put another way -

Unless the habitat requirements are known for each species and for each stage of that species life cycle, any attempt to manage it is guesswork.

Even as one decides on the precise combination of fauna and flora he wishes to maintain in the brushland community, in order to obtain any predictable goal, he must first have intimate knowledge of the requirements of each species. Such intimate knowledge of the biological resources is available for only a few species. As a result indicator species are often chosen, studied and managed for in the hope that what is good for the indicator species is good for man and good for the number of interrelated, unmanaged resources which cohabitate with the indicator species.

Such an approach is excellent if the underlying assumption is true, but can be disasterous for those species whose critical habitat needs are not shared with the indicator species..

Solution -

1. know natural history of all species in your area.
2. base management decisions re: wildlife on that data.

3. if decision is to eliminate all the habitat required by a particular species then the management plan should clearly state that the species will be eliminated.

1. Proper land use decisions cannot be made without an intimate knowledge of the resources being managed.
   a. All management decisions should leave the maximum number of options open for the future to allow for judgemental errors based on incomplete information.
   b. Management decisions should be continually reassessed as more recent data becomes available.

VIEWPOINTS ON BRUSHLAND RESOURCES

R. Brooks Sibley
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Paper presented at the People and Brushland Conference and Workshop held at Alder Springs, California May 3 and 4, 1975.

My task this evening is to review the role that educational institutions play in influencing the management of brushland areas. I can best accomplish this by presenting my interpretation of how a specific institution, Humboldt State University, contributes to the management of brushlands.

Humboldt State University makes a prime contribution to brushland management through assisting in the development of land management decision makers who will be responsible for managing brushlands and other forms of land resources. This institution makes a secondary contribution to brushland management through assisting in the development of favorable attitudes in all students concerning the need for intelligent, well planned land management activities. My discussion will stress the aspects of the prime contribution that Humboldt State University makes.

Humboldt State University is primarily an undergraduate institution of approximately 7,500 students located in Arcata, California. Humboldt is a multipurpose institution which uses the basic disciplines of liberal arts and sciences as the foundation for all aspects of its eductional program. A major purpose of Humboldt's curriculum is to furnish students with a broad, liberal education as well as to allow specialization within well defined subject matter areas. The School of National Resources at Humboldt State University has the responsibility of developing graduates educated and trained in natural resources management disiplines. This school is the institutional unit that assists in the development of decision makers who will influence the management of brushlands.

The School of Natural Resources has between 1600-1700 students enrolled in seven departments. These departments are Fisheries, Forestry, Natural Resources, Oceanography, Range Management, Watershed Management and Wildlife Management (Transparency 1 - discussion concerning departments). Students in all departments other than Oceanography will come into some level of contact with brushland complexes during their careers. Goals of the School of Natural Resources, that have guided curricula development, contribute to preparing students for brushland management responsibilities. The two major school goals are: 1) to evoke in students an understanding of the nature of natural resources and of the relationships which have existed, do exist and should exist between humans and resources. 2) to cultivate in students an understanding of the principles underlying the valuation, utilization and conservation of natural resources, and an ability to apply these principles. (Transparency 2 - Goals of School of Natural Resources) Using these goals as a framework I want to identify major categories of information that the School of Natural Resources presents to students to help prepare them for land management tasks related to brushland management. I place the information into seven categories, or modules, although no uniform classification of categories exists.

Categories (Modules) of Information Related to Brushland Management (Transparency 3 and 4)

1) Students are introduced to the concepts of a land ethic and ecological conscience as best exemplified by Aldo Leopold. They become cognizant of the human animals interdependency with land resources, and recognize that their role is not that of a conqueror but as a member of any land community, especially a brushland community.

2) Students become exposed to information showing that brushland communities are complex, and often fragile, entities. They learn to understand that any type of management of these communities has to be preceded by careful planning based on sound ecological information.

3) The multiple values of brushlands are identified and appraised. An individual learns that brushlands provide a range of values from those associated with a carefully designed subdivision located within a brushland community to those linked to an unmodified brushland area hosting native species of vegetation and animals.

4) Human demands for products and services which can be extracted from brushlands are focused upon and reviewed. Students become aware that demands for the use of brushlands change as life styles and quality of living standards become modified. A key idea presented is that demand can be met only if a full spectrum of brushland values are extracted through a variety of brushland manipulation techniques.

5) Students are introduced to a variety of management techniques and processes designed for application in brushland areas so that values can be extracted. They learn about hand and mechnical manipulation, the application of chemicals, the use of fire and the regulation of domestic animals in brushlands. They also become familiar with management processes that call for little or no manipulation of brushland communities.

6) Proper assessment of the characteristics of any brushland community is stressed. Students learn how to conduct resource inventories and how to assess to what extent manipulation techniques will alter the character of the community. They find themselves forced to consider brushland values, demands for brushland use, brushland characteristics and the land ethic before they can make a decision relating to the type of management to be undertaken in a specific brushland area.

7) Students are made aware of constant conflict and controversy related to brushland management activities. They learn to accept the fact that viewpoints on brushland management come from a variety of perspectives. They become prepared to engage in developing management decisions based on constant reappraisal of data relating to their decisions.

The preceding categories of information are covered in a variety of ways during a students tenure within the School of Natural Resources, as an example, during the Winter Term 1975 I taught Forestry 220, Advanced Wildland Fire Management. The course had a major focus on fuel modification. We reviewed procedures to modify fuels in brushland areas and become quite aware of the complexities of brushland management.

The School of Natural Resources still must continue to improve methods to give students a better data base from which to make brushland management decisions. I would appreciate receiving ideas from this group concerning what methods we should use plus what additional types of information concerning brushland management we should present to our students. Perhaps we can review such ideas during our discussion session later this evening.

VIEWPOINTS ON BRUSHLAND RESOURCES

Larry Kimil
Director Environmental Resources
California Chamber of Commerce

Blaine Cornell asked me to take part and comment on the value of brushlands from the standpoint of the business community. I guess I would summarize that viewpoint on values in two words and those words unfortunately would be "not much." And that is unfortunate and part of the reason brushlands in California are for the most part wasted lands.

You have to forgive the blunt statements. Perhaps if you understood the problems of my organization you can appreciate why I said what I did. Let me relate to you a few of the changes that have occured in California in the years since the Wildland Research Center was established in 1958 with the approval of Dr. Robert Gordon Sproul then chairman of the State Chamber of Commerce, Natural Resources Committee. At this time, great growth was occurring in our population and development. The Sierra Club was primarily concerned with creating new National Parks and getting a National Wilderness Act adopted.

Ecology was a word in the dictionary that no politician had ever read. Our legislature was debating the merits of a State water project and the big issue was the needs of areas of origin in the mountain counties. In terms of employment opportunities, the future for California young people was great. We were in the position of picking and choosing the industries we wanted to attract, and most importantly, people had confidence in science and technology, and that is an essential difference today. I recall a number of meetings about that time including a Wildland Management Conference in Yosemite in 1960 where some of the same issues that were discussed today were identified.

Now, what has happened since the days when the Forest Service was on a pedestal and the public fully supported resource management programs?

California changed. Leaders in urban centers who understood resources gradually died or retired. How many men like Bill Rosecrans' are alive today in Southern California?

California has urbanized and many of the public opinion leaders have no ties to the land. Reapportionment has caused this as well as the fact that most legislators are city people. Large landowners are now corporations and increasingly national corporations that are diversified and run by men who are responsible to stockholders annually.

The average Californian also has no ties to the land in his job. He takes his water for granted. It comes out of a faucet and consequently, he can't tell you where the water supply started. In fact we have to teach kids in San Francisco and Los Angeles that milk comes from natural spigots not Foremost's stainless steel refrigerated containers.

Resources are increasingly managed by fewer and fewer people. There are fewer, more effecient sawmills and the role of the wildland manager is increasingly less understood. I am not even sure that Smokey Bear should not have been retired earlier.

Finally, California is no longer the land of milk and honey. California now ranks 47th in business opportunities, only ahead of New York. It is extremely difficult if not impossible to entice new industry into California.

What then do brushlands represent to the business community today? Those that even think about the role of the 20 million plus acres of our State that fall into this category look at brushlands as a problem - not an opportunity. Economically brushlands on balance are an asset. To the insurance industry faced with policy losses from structural losses. To local government - a need for tougher regulations for subdivisions; to the knowledgable taxpayer - a growing cost for fire suppression; to building product manufacturers to structures, wood roofs etc.; to the resident in or adjacent to brushfields - a problem; to environmentalists - a challenge to stop the use of herbicides.

In recent years priorities in the natural resources field have gone to more pressing issues. Competition for public uses of brushlands have been less than for alpine or forested lands and controversies are not as well known.

VIEWPOINTS ON BRUSHLAND RESOURCES
"LEARNING TO LIVE WITH CHAPARRAL"

Doug Leisz
Regional Forester
California Region, U. S. Forest Service

Chaparral has existed for a long time and it's going to continue to be with us. We have to learn more about the magical wonder of the brushlands before we can live with them with less stress. Many people have the wrong idea on where the Forest Service is headed in working with chaparral. We are embarked on a careful program in selected areas such as you saw today. We are not embarked on a program to eliminate all chaparral. We are going about this in a very deliberate process with full public involvement.

Our approach to the brushlands continues along various lines. Basically, the Forest Service is using a Land Use Planning approach to the management of brushlands. Some of the things we are doing are:

1. Recognizing chaparral stands as land which need special zoning for uses. Keep residential uses from areas with these type of soils and vegetative types.

2. Identifying potential of soils associated with the brushlands. In other words, we are evaluating the capability of the land.

3. Identifying suitability of brushlands for various uses for all purposes (grazing, domestic livestock, wildlife, recreation etc.)

4. Data collection goes on in a never ending cycle. We don't have enough data today for all decisions. We want our decisions today to be consistent with the depth of our data.

5. We are using economic data not as a final decision point but as information we need to know before we make decisions. Nonmarketable (economic) values must also be identified and understood.

6. Land use plans are, by direction, designed to keep our options open for the future.

Now it would be nice to (theoretically anyway) make certain we had all the data before we make the first decision. It simply isn't possible nor will it ever be since we are working with nature. The process is a dynamic one. We continue to collect data. Plans and management directions are reevaluated for each activity by our environmental analysis work. As more data becomes available, we are continually reevaluating our activities and changing them where necessary.

Environmental considerations required by law have increased greatly in recent years. These will continue to increase and continue to change. Threatened and Endangered Species, Water Quality Standards, Fire Protection Needs - health and safety, Resource production needs and other emerging requirements will change our constraints and considerations in the future.

As far as brushland management is concerned our approach is that of Land Use Planning. Our first step is to collect all available data base. Then to identify interrelationships as far as possible. The next step is to identify all the various alternatives and look at them for the different uses. Another step is to get public involvement in the decision making process. This is a problem and is not always easy to do. We must make sure that we reach sound decisions on the basis of our existing data. We must also identify the need for additional data. We must continuously evaluate the results through planned monitoring. And finally, we must trigger changes in our basic plans where appropriate.

To summarize our approach to brushland management, it is our intent to meet specific objectives through a comprehensive balanced program of brushland management (modification) and other resource protection and management actions.

VIEWPOINTS ON BRUSHLAND RESOURCES

Lewis Moran
Acting Director
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State of California

Meetings, conferences, and workshops like this are one means of getting acquainted with the relationships between people and the brushland resources of California. In this way we are trying to learn more about the brushlands--how to use the resources; how to solve the problems--and how people interact with them or react to them.

Values of Brushland Resources

In trying to "get a handle on" a question like this it is useful to take a look at the values as well as the problems of the resource. Our brushlands have many values--but they are different values to different people.

Among values often mentioned are wildlife habitat; water production and watershed protection; grazing land--which may be actual or potential; enjoyment for many people; for observing and studying nature; and for homes for our growing population.

Public Interest in Brushland Resources

Although a large share of our brushland resources are in private ownership, there is a greater or lesser degree of public interest in each of the above values.

What is the value to the public--to society at large--of a gallon of water from a brushland watershed? What does a private landowner gain from the fact that members of the general public may receive aesthetic benefits from looking at his brushland? How much is a cow or a sheep grazing on brushland range worth to society? To what extent should public funds be used to protect private lands so that city dwellers may have brushlands for recreation?

The difficulty in answering these questions is in evaluating the share of costs and returns that should be assigned to the private owner, and that which should be borne by the public. Property rights are involved, also.

We cannot hang a neat price tag on any of these things, because they are "intangibles." While they are very real to most persons, they are not actual physical objects which can be passed from one person to another; they cannot be bought and sold in the market place. In many cases the solution may be in terms of "trade offs;" How many deer does it take to equal a cow? How many sheep are we willing (and able) to trade for a coyote? What are the comparative values of meat on the table and water in the faucet?

We must recognize, too, that making allocations of values, or of costs and returns, between private ownership and public interest in these brushlands will require broad scale and long-range land use planning. It will require long-term commitment of resources to attain the objectives established. This of necessity will involve some degree of public control over the private lands to protect this public interest, with consequent reduction in the rights

of the private property owner. What trade offs are we willing to make here?

PROBLEMS OF BRUSHLAND RESOURCES

The major problems to be solved in dealing with our brushland resources are an old, old story to Californians. Brush control on rangelands; fire protection for the wildlands; maintaining an effective plant cover to protect the soil from deterioration; maintaining levels of use which will not result in pollution or other forms of environmental degradation.

The California livestock industry produces more than $200 million worth of meat each year; a significant part comes from the brushland ranges. And brush is by far the most important weed on our range lands, constituting a problem on nearly 17 million acres. Brush also is a severe fire hazard on the ranges, and on other wild lands. In more recent years recreation and home development have moved into the brushland, taking over expanding acreages and bringing larger numbers of people to them. "People pressures" have increased tremendously--not only from more persons actually living in the brushlands part or all of the year, but also from the ever-increasing numbers who use them for hunting, bike riding, and forms of recreation. These increased uses have brought not only a greater potential for fires, but problems of erosion, pollution, and other ills which afflict our modern society.

Solution of the problem of brushland fires is a major concern of the California Division of Forestry. This solution lies not only in more effective fire fighting forces, but in measures which may be taken before the fire starts. It includes not only the traditional fire prevention action, such as fuel management. Basically, fuel management involved reduction in amounts of fuel in the brushlands, so that fires will not start so easily; will burn less rapidly; and can be controlled more readily. Fuelbreaks that are well planned and properly maintained are one means of managing fuels. Encouraging reduction and cleanup of wildland fuels in other ways; adequate planning of fire protection measures about wildland developments and use areas; and taking advantage of the reduced fuel volume on controlled burns are other measures which will be helpful.

Controlled burns by ranchers have been an important factor in breaking up large expanses of brushland fuels. This helps fire control operations in a number of ways. However, this activity has been decreasing during the last fifteen years. There are many reasons; the economics of livestock ranching have been unfavorable; the two million acres which have been burned by ranchers include the brushlands most easily treated; cost of preparation and burning have increased; and the great amount of development and use of brushlands have brought greater dangers to life and property. Land values have increased, causing greater liability if a controlled burn should escape; some ranchers have had difficulty in obtaining adequate liability insurance coverage. The threat of collection of suppression costs, should action by a public agency be required to control an escape has been cited as a reason for the decline in controlled burns. However, in only a very few instances, where there was clear evidence of a violation of statutes or permit conditions, has the Division of Forestry ever collected suppression costs for an escape from a range improvement burn. The concern about liability for suppression costs should be lessened by a recent Court of Appeals ruling. This ruling upheld the decision of the Superior Court in Kern County that an insurance company is liable for suppression costs by a public fire control

agency, if they should be incurred, under the comprehensive liability policy which the rancher usually carries.

It has been asked: "Why doesn't the Division of Forestry do prescribed burning on private lands as part of its fuel management program, to prevent wild fires?" For the state to burn brush on private property for fuel hazard reduction, does not seem to be more than a logical and necessary expansion of the current fuelbreak program. However, it would require both new legislation and additional funding to do this. Legislation would be required for two purposes:

1. To establish without question that the burning and other fuel management measures employed on private lands were in fact for a public purpose; and

2. To protect the state, and its employees, individually, from Personal liability for damages which resulted from any of these activities, including damages from fire which got out of control.

The additional funding required would depend upon the size and nature of the program desired.

It must be remembered, too, that if public funds are expended on private lands, then there must be some degree of public control over those lands to protect the interests of the public.

To develop California's brushland resources and manage them effectively will require co-operation between private land owners, public land management agencies, and fire protection organizations. It will be difficult to implement management programs because of the range of sizes and uses of the units of land involved, and the fact that these units seldom coincide with the aritficial boundaries established by man. For whatever purpose it is undertaken, management of brushland resources will ultimately include a combination of the methods available, if it is to be effective. Whatever methods used, they must be chosen for reasons of economy, conservation of energy, and their over-all beneficial effects on the environment.

BRUSHLAND MANAGEMENT WORKSHOP

Introduction

In order to develop reasonable objectives which result in a management direction, you must examine the resource values with which you work. We would like you to look at the suggested resource values and rate them according to their importance as you see them. This rating will be helpful in developing some objectives for managing the brushlands. You are welcome to add other values that you feel are important. We would suggest you do the following:

1. Rate each resource value on a scale of 1 (least important) to 10 (most important).

2. Develop some management objectives for the brushlands.

Definitions of Resource Values

1. Food and Fibre: These values include the various food stuffs that can be produced in the brushland, i.e., livestock forage (red meat program); energy sources such as fuel (cellulose), distillates, etc., and wood fibre, such as chips, pulp, etc.

2. Wildlife Habitat Consumptive: These resource values include wildlife habitat for the purpose of harvesting the big and small game produced on these lands.

3. Wildlife Habitat - Non-consumptive: These resource values include providing wildlife habitat for purposes other than harvesting (hunting). This includes providing wildlife so people may view different wildlife populations, providing habitat for rare and threatened wildlife species and possibly providing wildlife habitat for exotic (introduced) species.

4. Water Production: This is the value of brushlands for producing water through various treatments.

5. Social: These values include recreation (hunting, viewing scenery, open space, off-road vehicle use, etc.) and visual resources (visual effects of management techniques).

6. Research and Education: These values include research natural areas (natural areas where scientific research can be carried out), botanical areas (areas where rare or unique plant species are protected) and operational and applied research areas where educational opportunities can be explored.

7. Environmental Component: These values include such things as air quality, water quality, soil protection, waste disposal, fire hazard, and the protection of threatened and endangered animals, plants and insects.

BRUSHLAND MANAGEMENT WORKSHOP SUMMARY
RESOURCE VALUE RATINGS

Resource	Group Ratings 1	2	3	4	5	6	Total	Avg.
Food and Fiber	7	6.6	6.4	5	6	8	39.0	6.5
Wildlife Habitat Consumptive	7	5.4	6.4	8	9	5	40.8	6.8
Wildlife Habitat Non-Consumptive	6	5.7	4.6	6	7	5	34.3	5.7
Watershed	10	8.3	8.2	10	10	9	55.5	9.3
Social	7	5.8	6.3	7	9	6	41.1	6.9
Research and Education	6	6.5	5.8	4	7	4	33.3	5.6
Environmental Component	9	6.7	8.4	9	10	6	49.1	8.2
Other: Potential Value						8		

GROUP REPORTS

Group I

We played the game of consensus, and it was a pretty interesting process. We were compelled, some of us, to moderate initial positions by people who could best focus our attention on the local situation in Grindstone Canyon and its relationship, in terms of population and accessibility, to the rest of California. I think some of our values were influenced a good bit. In other situations we might have scored social or research values higher than we did.

I think for a group of this size we were reasonably able to submerge our biased positions and actually listen to one another. Instead of being deaf to compromise, we really achieved a meeting of minds. We were pleased to see that our priorities ranked close to the average for all the groups.

Group II

No matter what your frame of reference is or what your priorities are, things are so interrelated that there was no real disagreement in our group. We looked at the problem from different viewpoints and determined that what is good for one usually has some benefit for another.

We had one panelist who said he didn't feel qualified to comment. He said he was a computer scientist. But we told him we would like to have his views because he did not have the same background as many of us. In fact, his views were much the same as the majority, but he put more emphasis on social values.

We had a discussion based on our computer scientist's views and decided research, education, and social values could have been given somewhat different priorities; there is overlap throughout, even with wildlife.

Group III

Our priorities are pretty close to the figures you see. However, our number 1 was Environmental Component, and if you go through its definition we weren't, as a group, particularly concerned with air quality or waste disposal as far as Grindstone Canyon is concerned. I think the Forest Service has waste disposal in canyons pretty well corralled, and we weren't particularly concerned with threatened and endangered species in Grindstone Canyon. I am sure there are probably brush areas in California where the latter might be a big factor.

Fire hazard is the reason Environmental Component has a high priority. Fire hazard probably was a big factor in the other six categories, maybe the leading one. For this reason Environmental Component is our number 1, and number 2 is Watershed. But these things are so interrelated that it is pretty tough to make a decision.

It was an interesting exercise. For example, under Watershed, the soil protection, water quality, and water quantity components had ratings from 1 to 10. Our group was quite diversified, and many viewpoints were expressed.

Group IV

I think in our group we had some interesting controversies develop. We agreed that Watershed was number 1, but within that priority there was quite some disagreement. We had a tendency to split; within one of two subgroups it was possible to influence your neighbor more than in the other. But our consensus was that soil protection is the most important factor within Watershed. We did have some problems separating two factors, soil protection and water quality; we could not see these as independent factors, but to vote on these objectively we had to consider them independent factors. Watershed was number 1.

Environmental Component was number 2, and there was complete agreement that fire hazard was negative under this resource value. Air quality was thought to be second, and threatened and endangered wildlife and waste disposal followed.

After these decisions I suggested Grindstone Canyon area should be our major concern. The majority believed that this was not the issue; the issue should be all brushlands. So we tried to handle all the brushlands of the State in the total questionnaire.

Third was Wildlife Habitat Consumptive. One member of the committee did not want to vote this way because he objected to the word "hunting" in the questionnaire. He preferred the word "harvesting". My question, of course, is how do you harvest deer other than by hunting, but even so, harvesting was more desirable to him than hunting. Use of words in the questionnaire did introduce some bias at this point.

Actually, after we chose the first two priorities, we couldn't agree on the third. As chairman, I then suggested we try and find the lowest priority. We went to individual member votes at this point rather than coming to a consensus. After selecting the top two priorities, it was purely a democratic process; it was no longer selection by consensus.

Group V

Our consensus was based on Grindstone Canyon and its brush fields. We decided to express our ratings in terms of present day knowledge and technology rather than consider what might develop in the future such as harvest of wood fiber from brush fields.

As you can see, we gave Watershed and Environmental Component each the highest rating followed by Social and Wildlife Habitat Consumptive categories second. Actually, all resources received fairly high ratings. That was due primarily to ratings received by one category within the subcategories. We felt that there was generally one subcategory within each major value that was very important. This would receive a high rating and alone influence priorities for each value.

We had a lot of indecision. There were only a couple of the seven about which there was little question. One of the two was Environmental Component. Member votes on the others ranged from 1 to 10.

We had considerable discussion on definitions. We felt that not all important subcategories had been included. But we rated those listed and added others to come up with a final resource value rating.

Group VI

We had an interesting discussion about the method we would use in reaching our final decision. We ended up with a formula: summation of the individual evaluations divided by the total number of participants. This we used because we couldn't agree.

We had numerous discussions trying to convince one or two of our group to agree with the rest on several of the items. We were not completely successful although the discussions were interesting.

Through use of the formula, Watershed was given the highest value. Next was Food and Fiber. The rest were closely grouped, but Research and Education received the lowest priority.

YOU SAID IT - NOW WHAT CAN YOU DO ABOUT IT?

William L. Reavley
Western Executive Director
National Wildlife Federation

C. P. Snow told America sometime ago that by 1975 we could be watching millions of people starving to death on our colored TV sets. The rash of so called doom sayers, such as the Paddock Brothers who wrote Famine-1975, Paul Ehrlich, The Club of Rome and many others really didn't change anything. It was business as usual. However, when the $11.00 per barrel oil price was put upon us by the Arab nations some notice accompanied this. We are now dependent upon foreign oil sources in the amount of 40% and that figure seems to be climbing. We are paying billions for this share of the world's energy.

One way we pay it is to produce increasing amounts of farm products. Very recently we have abandon or set aside programs and are plowing up more land than ever before. We are now tilling the land that has a high soil erosion risk and we are increasingly removing wildlife habitat, native plants and other amenities thought to be valuable as an American tradition. We are doing so for humanitarian reasons and also for the great necessity of trying to equalize our balance of payments, so we won't go belly up financially.

This nation, in spite of the emergency, does not have an energy policy but we have been assured that agriculture will receive a high priority when allocations of energy become necessary. In essense this concept implies that lands with the greatest productivity will be receiving the greatest energy allocations. This would place range rehabilitation, type conversions and wildland management in a lower priroity level. This would indicate less funds, materials and man power to do the kind of work we were all pleased to see here on the Mendocino National Forest.

While much federal lands are not in an excellent condition at this time, and especially those administered by the Bureau of Land Management, there will undoubtedly be increasing demands for goods and services from low producing tired acres. More demand for grass fed red meat, to relieve the world grain strain problem, more mining for important scarce materials such as uranium, development of geothermal sites, removal of coal, transportation routes for electricity, water and other human needs, as well as sites for solar energy devices will all have marked effects upon western range lands. We know that methanol can be made from western forms of brushy plants and it may become important because it can be added to gasoline up to 20% without major engine changes, which would save considerable gasoline. Livestock feed can also be manufactured from brushy range land plants. There is here the possibility of utilizing products from western lands. Perhaps in the future we will not be able to afford prescribed or controlled fires, nor will we tolerate uncontrolled wild fires.

But whatever the demands that will be made upon western range lands there is a limit to the ability of this environment to fulfill these demands. That is a natural phenomena not entirely recognized by the political system under which America is governed. Federal agencies whose policies are established at the Cabinet level frequently seek favorable political reaction by

making rash promises of supplying goods and services from federal lands when such resources are in fact not available. To the extent possible, resource managers in the federal service should strive to educate the public that lands under their jurisdiction have limits of productivity. At best, under our political system long range planning to perpetuate the triangle of soil, water and vegetation, above all other values, is difficult to achieve due to the changes in philosophy favored by each of the two political parties. Good management, as exemplified here on the Mendocino Forest does have a tendency to smooth out sharply opposed political philosophies.

As an aside, it should be remembered that type conversions or range rehabilitation programs are not new nor confined to this area. Much good work has been accomplished in most of the western states with some fine examples in Idaho, Utah, Colorado, Nevada and elsewhere. In the Federal system there may be some merit in coorelating these kinds of habitat manipulations so maximum knowledge is available to all concerned and in order to seek funding in a uniform manner.

Land use planning, a highly controversial exercise, is an extremely important part of land use management. The Forest Service is doing an excellent job in it's own long range planning effort. Eventually there is going to be increasing interface between planning on federal and state lands and the private holdings. Planning on the basis of ecological units must become a part of the system. The range improvements we have seen during this workshop most certainly serve as a focal point where manipulations at the top of the water shed effect in one way or another all of the lands down the stream, all the way to Willows. Someday we may be looking at long range plans of this nature, community by community, encompassing all of the lands of various ownerships within natural units. Utah has done some of this inventory and planning through the Division of Man and the Environment of Utah State University.

The over-all bad news that prevails wherein man seems to be populating the earth at a rate faster than our ability to provide, need not do us all in. We have been fortunate enough to witness an information explosion the like of which has never before existed. Young people today come from our institutions of learing with vastly more basic information than even twenty years ago. If we are to survive we must get on with the job of transferring this knowledge into a workable formula. We must minimize our committments to traditional values, forgetting as much as we can that each of us represents something--big business, a federal agency, a local government, a private conservation organization, a product or a service, and think of ourselves as responsible Americans, all striving to make it a place where future generations can live as well as we have.

Further, we must strive for more diverse audiences and a broader cross section of America in selling what is good land management, such as the brushland program we have explored on this trip. Specifically, this program should be sold to every kind of social and civic club that will listen. We should especially cultivate those that write and speak for the mass media, from the outdoor writer to the managing editor. Together we should strive to develop and maintain a large public interest in land use planning, using each community to obtain personal involvement. This work on the Stony Brook watershed illustrates the kind of benefits that planning provides.

The Forest Service, the Fish and Game Department and all local cooperators should be complimented on the work they are doing. All of your ideas on how to expand the project will be welcome. Please let us hear from you.

SOME BRUSHLAND MANAGEMENT VALUES ASSOCIATED WITH THE MENDOCINO NATIONAL FOREST

Wildlife Values

1. The present deer herd numbers from 3 to 4 per square mile.

2. Studies indicate carrying capacity can be doubled through the use of prescribed burning alone.

3. With additional treatment (herbicide spraying and grass seeding) carrying capacities can be tripled or even quadrupled.

Watershed Values

1. Estimated annual sediment yield on a typical brushland site.

   a. 80% vegetative cover - natural condition

      20% slope - 0.136 tons/acre
      40% slope - 0.259 tons/acre
      80% slope - 0.417 tons/acre

   b. 0% vegetative cover

      20% slope - 19.64 tons/acre
      40% slope - 37.19 tons/acre
      80% slope - 60.37 tons/acre

2. Water yield does not increase appreciably in converted areas.

Forage Values

1. New type conversions have a carrying capacity of 1 animal unit month per acre.

2. Stabilized type conversions have a carrying capacity of 1 animal unit month per 1½ to 2 acres.

3. Type conversions will produce 45 to 60 pounds of weight gain per acre per season.

Fire Values

1. Managed fires are more visibly acceptable than wild fires. Visual impact of small burned areas is much less than a large burned area.

2. Type conversions and fuelbreaks greatly decrease fire size and the resultant costs of suppression under most fire weather conditions.

Recreation Values

1. Values for the viewer and hunter will increase in proportion to the increased wildlife numbers.

2. Visual variety in the landscape is increased with brushland management projects. It is possible to increase the visual resource variety classification from one level to another. For example, the Grindstone project has increased its variety class from C (Minimal Variety) to B (Common Variety) by the manipulation of vegetation.

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